National Aeronautics and Space Administration

Asteroid Redirect Mission

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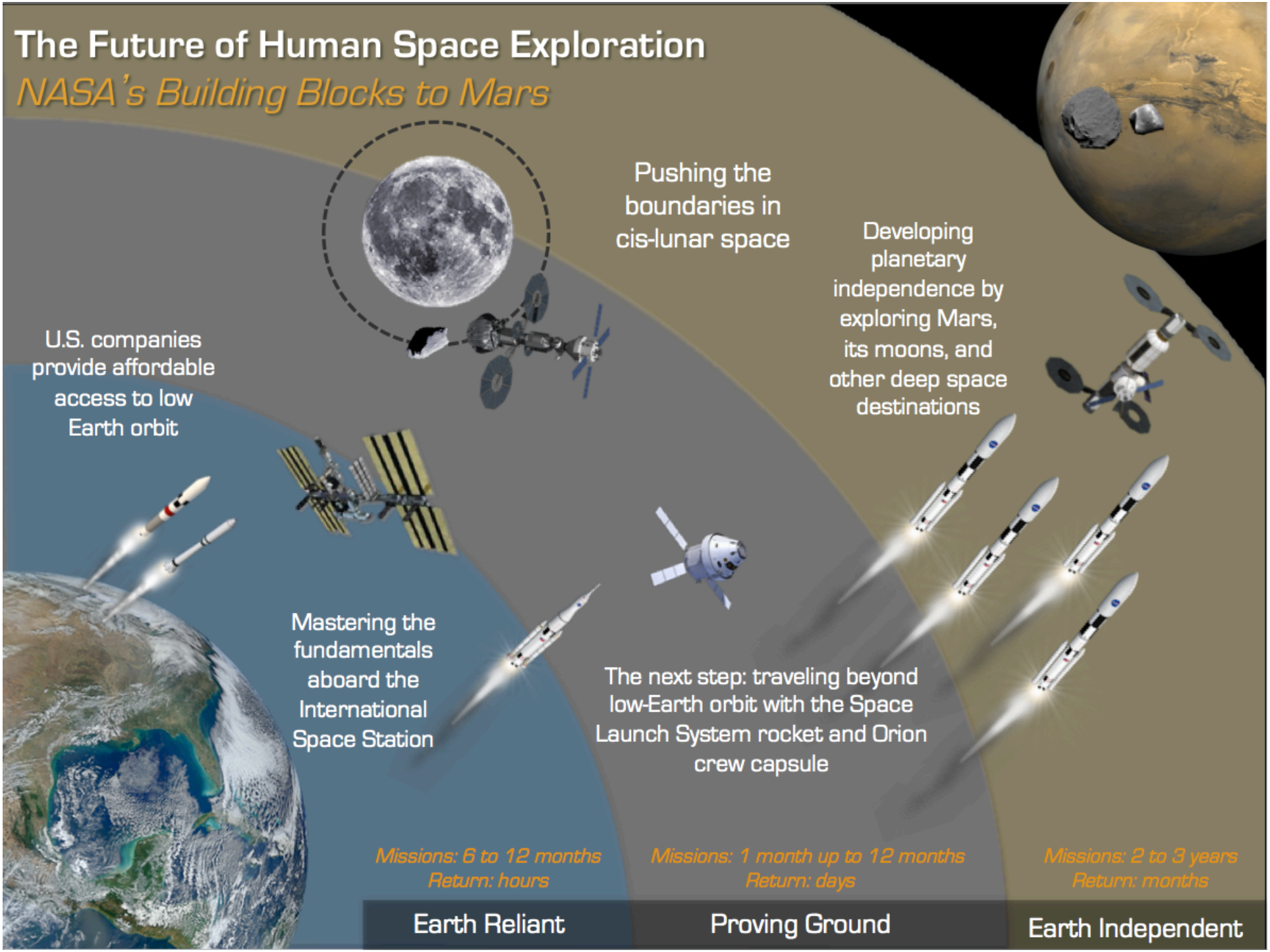

The Future of Human Space Exploration
NASA's Building Blocks to Mars
U.S. companies provide affordable access to low Earth orbit
Mastering the fundamentals aboard the International Space Station
Pushing the boundaries in cis-lunar space
The next step: traveling beyond low-Earth orbit with the Space Launch System rocket and Orion crew capsule
Developing planetary independence by exploring Mars, its moons, and other deep space destinations
Missions: 6 to 12 months
Return: hours
Earth Reliant
Missions: 1 month up to 12 months
Return: days
Proving Ground
Missions: 2 to 3 years
Return: months
Earth Independent

Asteroid Redirect Mission

Identify

Asteroid Identification:

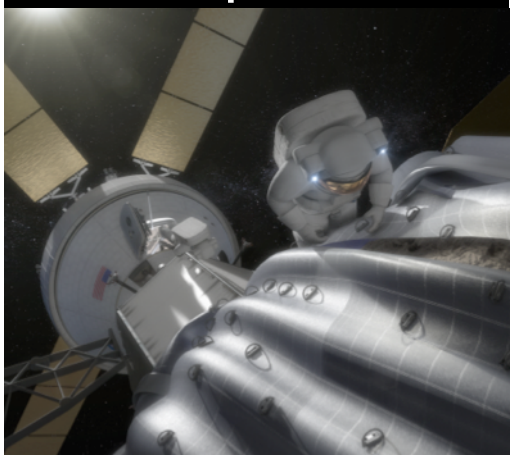
Ground and space based near Earth asteroid (NEA) target detection, characterization and selection

Redirect

Asteroid Redirect Robotic Mission:

High power solar electric propulsion (SEP) based robotic asteroid redirect to lunar distant retrograde orbit

Explore



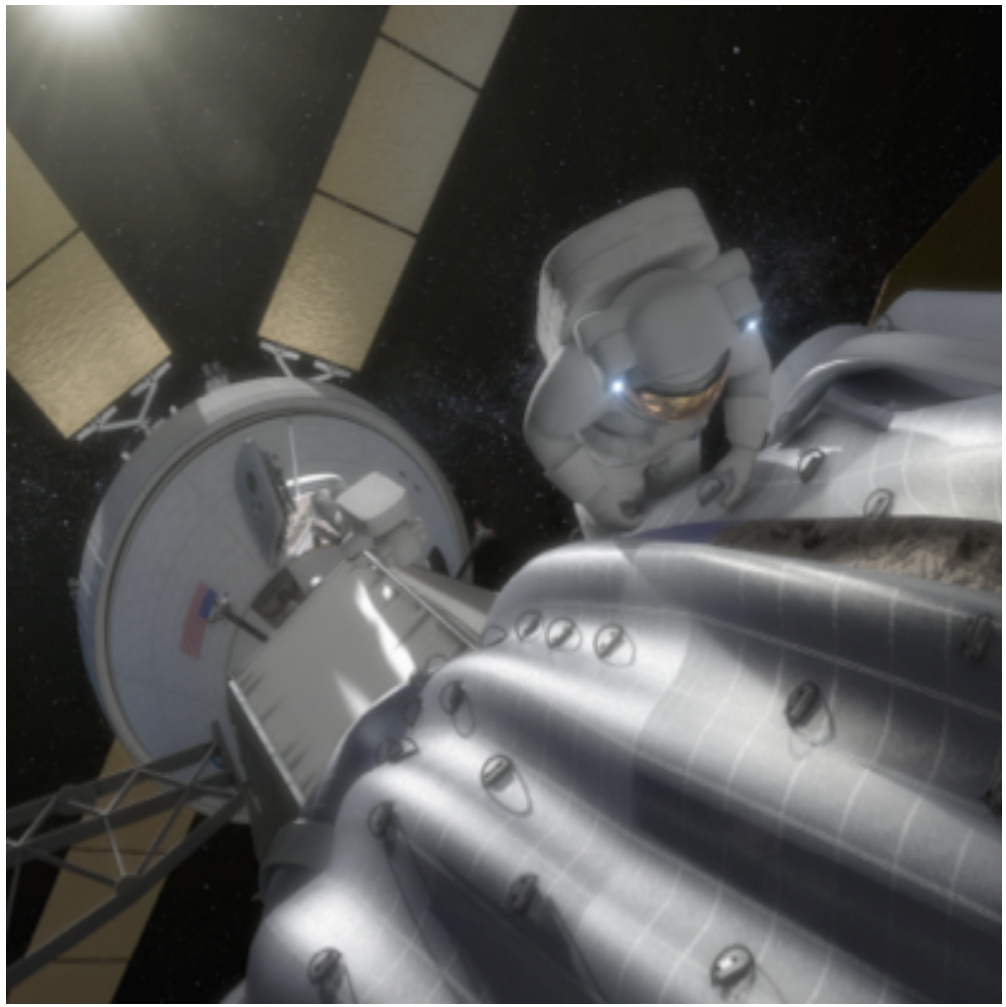
Asteroid Redirect Crewed Mission:

Orion and Space Launch System based crewed rendezvous and sampling mission to the relocated asteroid

Asteroid Redirect Mission
Builds on Investments Already Being Made by NASA

- **ARM integrates several building blocks of human space exploration to initiate deep space exploration**
  - **ISS experience**
  - **Orion and SLS**
  - **SEP and other technologies**

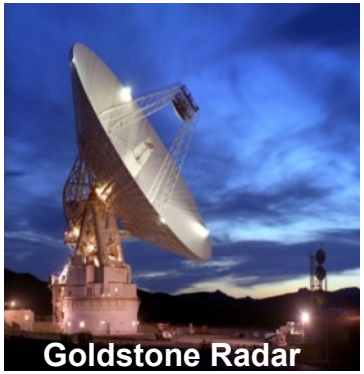
- **Contributes significantly to the extension of the human exploration of space beyond LEO in an affordable and sustainable way**
  - **Operate 1000 times farther than LEO for the first time in 4 decades.**
  - **Longer duration beyond LEO crewed mission than ever**



Near Earth Object Identification – Key Assets

Catalina Sky Survey

Utilize Radar (Goldstone and Arecibo) increased time for NEO observations.

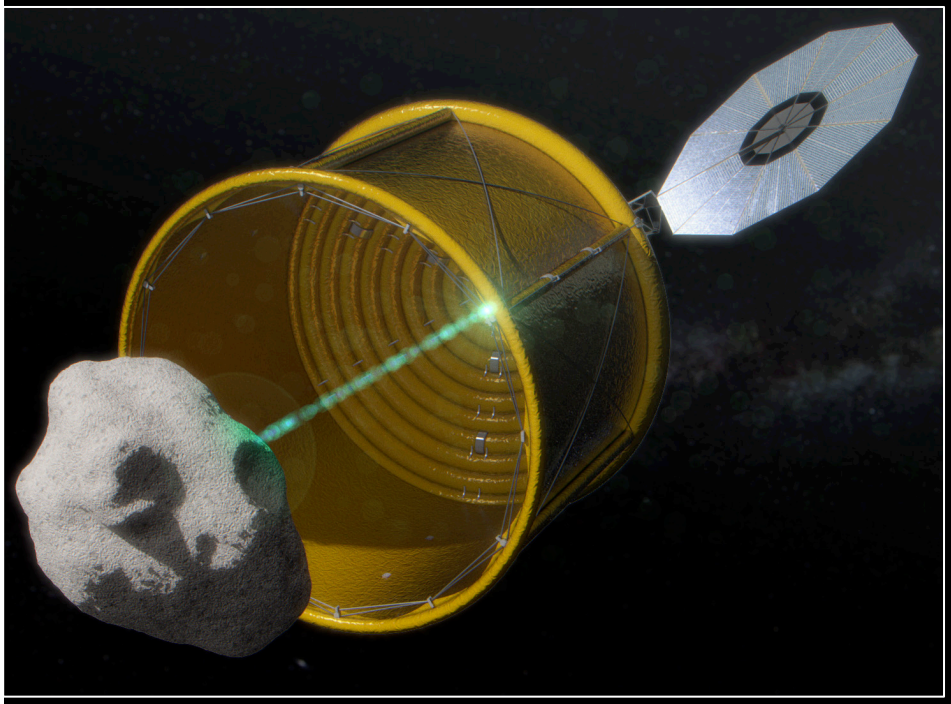


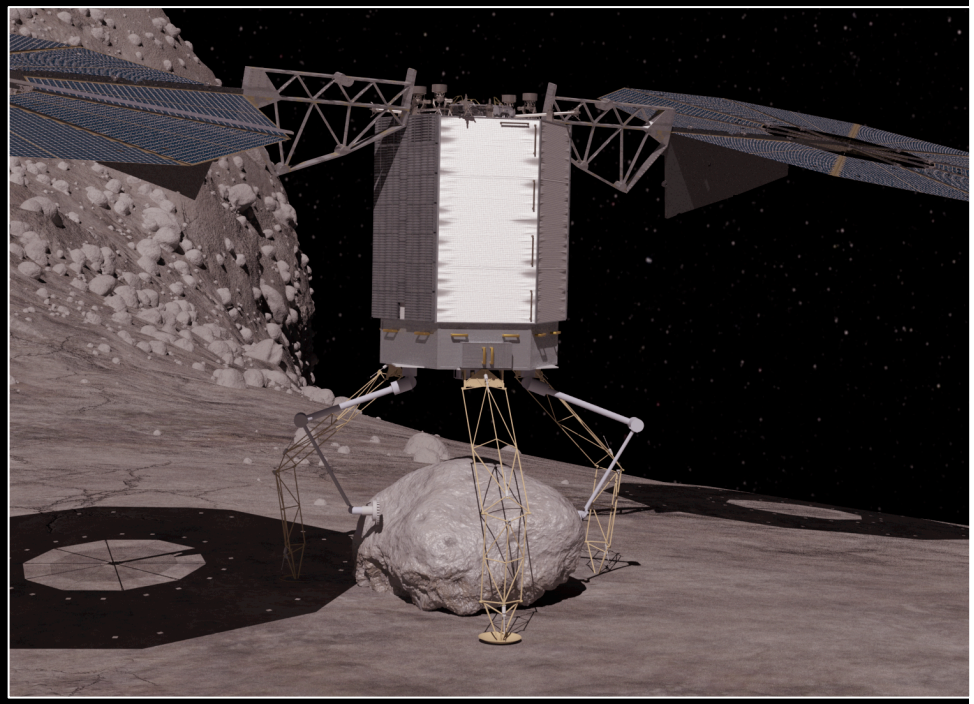
NEOWISE reactivated and dedicated to NEO Search & Characterization

NASA InfraRed Telescope Facility (IRTF)

- Increase On-call for Rapid Response.
- Improve Instrumentation for Spectroscopy and Thermal Signatures.

Asteroid Redirect Mission: Two Robotic Capture Options



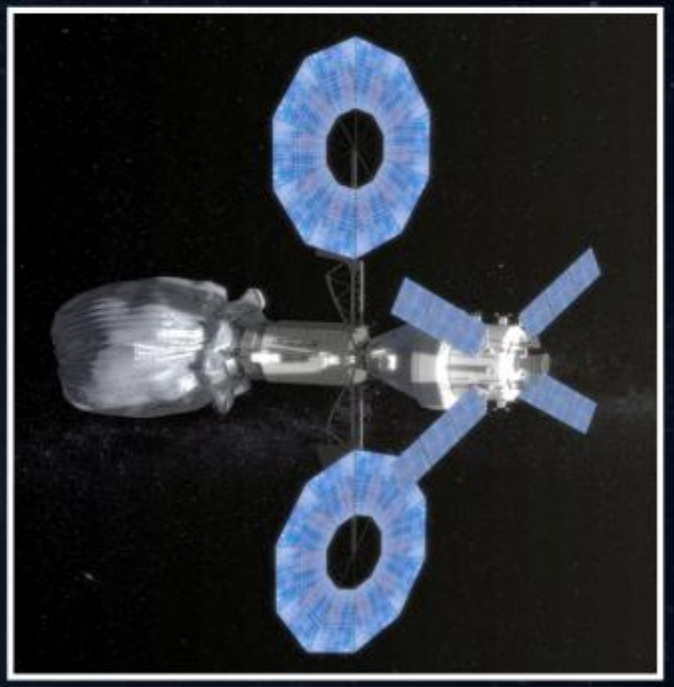


Asteroid Redirect Crewed Mission Overview

Deliver crew on SLS/Orion

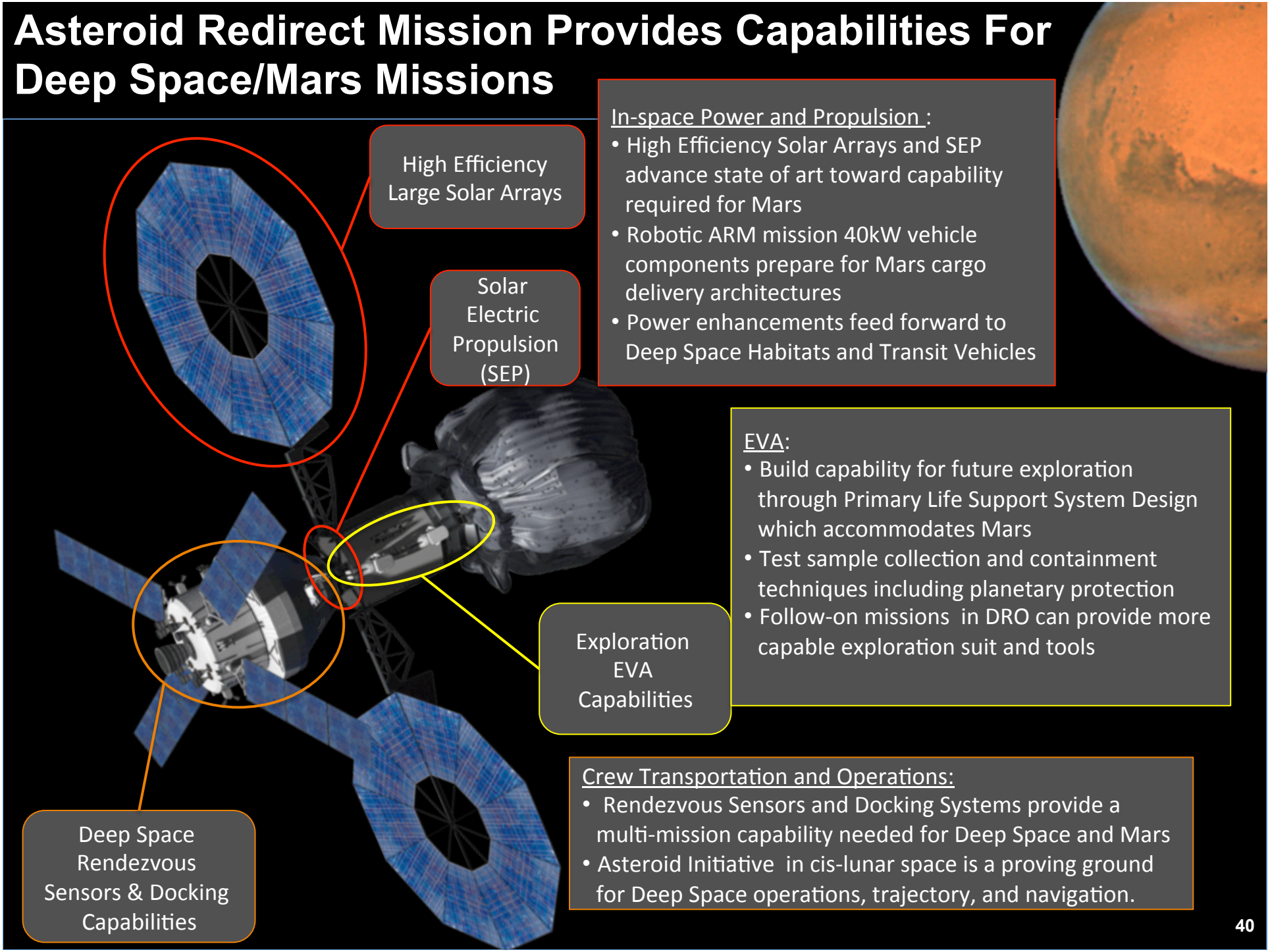
Return crew safely to Earth with asteroid samples in Orion

Orion Docks to Robotic Spacecraft



EVA from Orion to retrieve asteroid samples

Asteroid Redirect Mission Provides Capabilities For Deep Space/Mars Missions



In-space Power and Propulsion :

- High Efficiency Solar Arrays and SEP advance state of art toward capability required for Mars
- Robotic ARM mission 40kW vehicle components prepare for Mars cargo delivery architectures
- Power enhancements feed forward to Deep Space Habitats and Transit Vehicles

EVA:

- Build capability for future exploration through Primary Life Support System Design which accommodates Mars
- Test sample collection and containment techniques including planetary protection
- Follow-on missions in DRO can provide more capable exploration suit and tools

Crew Transportation and Operations:

- Rendezvous Sensors and Docking Systems provide a multi-mission capability needed for Deep Space and Mars
- Asteroid Initiative in cis-lunar space is a proving ground for Deep Space operations, trajectory, and navigation.